18

Le Cam at Berkeley

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Written in appreciation of the pleasure and many benefits I have received from over forty years of friendship and collegiality with Lucien Le Cam.

18.1 Early Life

In 1950 a young Frenchman came to Berkeley for a one-year visit. To his great surprise he stayed on and has remained in Berkeley ever since (though he is still a French citizen).

Le Cam was born in 1924 and spent his early life on a farm leased by his family in Creuse, Central France.

After a somewhat unconventional education, he obtained his License en Sciences (roughly equivalent to a BA) at the University of Paris in 1945. For reasons of convenience he selected as one of his examination topics Statistics,a subject in which he had no background and for which he prepared himself in less than a week by reading the lecture notes of the examiner, George Darmois. With the help of Darmois, he obtained a position as statisticianat what was evolving into the Electricite de France. This job enabled him occasionally to attend seminars at the university, and at one of these he met Neyman. The meeting, together with recommendations by Charles Stein (who had spent the preceding year in Paris) and Maurice Frechet, led to an invitation to spend a year in Berkeley as Lecturer in Statistics.

At Berkeley, he found that his background did not quite match what was expected either in mathematics or statistics. On the one hand, his statistics was applied and included little theory. On the other, the only modern mathematics he knew came from reading the books of Bourbaki. So he accepted a suggestion by Neyman to stay on for another year and complete his training by getting a California Ph.D.

Throughout his school career, Le Cam had problems with examinations, occasionally even managing to fail them. An explanation is offered by a story he tells of himself. In an early intelligence test, he was asked to give the next entry in the sequence 3,5,7, ... His answer was 11, and his score on the test dismal. Now, in Berkeley, he managed to fail the Ph.D. Qual-

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ifying Examination. The assignment was to give an hour lecture on fixed point theorems and Le Cam decided to present the latest and most general version he was able to find in the literature. This required first providing a considerable amount of preparatory algebraic topology, and before he knew it the hour was over-he had never reached the main result. Repeating the examination a few months later, he took a less abstract approach. However, he included a new proof of his own which was vigorously (and, as it later turned out, incorrectly) disputed by one of the examiners. This time he passed, but only barely.

Le Cam obtained his doctorate in 1952, but this was preceded by another event, his marriage earlier in the year to Louise Romig. In an autobiograhical sketch (Albers, Alexanderson & Reid 1990)[2] he reports that when he told Neyman about the impending marriage, "he flew into a rage. He called my future father-in-law, Harry Romig, who was also a statistician, and told him it was 'illegal' for me to get married because I had not finished my thesis. Actually it was finished except for a few pages still to be typed. I went ahead and got married anyway in April 1952. I was awarded my Ph.D. that June".

The thesis (Le Cam 1953), "On Some Asymptotic Properties of Maximum Likelihood Estimates and Related Bayes Estimates", has since became a classic. It grew out of the discovery in the preceding year by Joe Hodges of the phenomenon of superefficiency, which had confounded the universally held belief in the efficiency of maximum likelihood estimators. One of the principal results ofLe Cam's thesis now provided damage control by showing that superefficiency can be achieved only on a set of measure zero.

On completing his degree, Le Cam accepted Neyman's offer of a ladder appointment as Instructor. He obtained tenure in 1958 and the Professorship in 1960. The following year he succeeded David Blackwell as chair of the Statistics Department.

18.2 University and Scientific Administration

Le Cam's term of office was marked by a phenomenal growth of the Department. In 1961 the Faculty consisted of twelve members; by the end of his term, four years later, the number had increased to twenty. In large measure this success was due to his vigorous and untiring efforts. They were helped by the general popularity of science in the post-Sputnik era, and by continuing growth of enrollment in statistics courses and of the field of statistics in the world at large.

Both as a member of the Department and as its chair Le Cam held

[2]This sketch provides much additional detail on Le Cam's early life.

opinions which he liked to bring to the attention of his colleagues and the University administration in long, provocative and amusing letters. These were enjoyed by the Faculty but were less popular with the Deans and Chancellors.

Following are excerpts from one such communication (written in 1958) regarding a proposal by his colleague Loeve to strengthen the probability part of a one-year introduction to probability and statistics at the senior/first year graduate level. Some of the statisticians in the Department had protested that such additional material was more than what students at this level and in the time available could handle, and that the change would infringe on the statistical content of the course. Here are some excerpts from Le Cam's "Comment on 'Comments on Loeve's proposed revision' ".

> The proposed revision seems to arouse such violent opposition that the inarticulate undersigned feels obligated to communicate his feelings on the subject by the present memo.
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> Loeve's proposal seemed at first so innocuous and so gentle that I did not expect much reaction to it from any side, except possibly that practical people (are statisticians supposed to be practical?) might desire even more emphasis on applicable probability theory. As of now I consider the differences of opinion ariSIng in our midst are irreconcilable and due to such basic differences of understanding of what is and what should be probability theory and how it should be taught that no useful purpose will be derived by arguing any further in the same direction. Therefore the present memo will not propose any solutions but only try to generate some heat on controversial matters.
>
> Our teaching of Probability and consequently Statistics is hopeLessly inadequate. As far as I can tell, the people who struggle through [our basic courses] do not even get a knowledge of probability remotely comparable to the knowledge imparted by J. Dubourdieu in his evening lectures to candidates to the Actuarial examination in Paris.
>
> In case one should object that Probability Theory per se is not a worthy subject of study, I shall make my next point: The statisticians who are going to make the headlines in the future are not those who can in a twinkling give an analysis of variance for a Latin Square or a three-way classification. Statistics is basically much more complicated than Probability, would it be only because where the Probabilist has only one measure to cope with, the statistician has a family of measures. There is of course plenty to do in statistics without using complicated machinery. It just requires brains. This last commodity we cannot dispense to the students, but we can give them tools.

> If we would give our students a good background in mathematics and probability, we might be able to teach them more, not, less, statistics in a shorter time. Otherwise we are bound to produce Ph.D.'s in Statistics who cannot even read the statistical papers of our Symposia, not to mention the sundry applied papers to be 'found in the same Symposia.
> If this memo seems unreasonable to you, I will gladly restore it to its original strength and triple the emphasis on the necessity of teaching probability theory as a major part of our task and not as an undignified accessory to some statistical arguments.

Talking with chairman Le Cam, some time in 1962, Neyman mused on the fact that the following year marked not only the 150th anniversary of Laplace's "TMorie Analytique des Probabilites" but also the 200th anniversary of the posthumous publication of Bayes' "Essay Toward Solving a Problem in the Doctrine of Chances" and the 250th of Jacob Bernoulli's "Ars Conjectandi". To celebrate this remarkable triple anniversary Neyman proposed to Le Cam an international research seminar to be held at Berkeley. It was difficult to obtain financial support for such a meeting in the short time available, and the seminar was replaced by a series of individuallectures over a period of time during 1963, which were published two years later (Neyman & Le Cam 1965).

After plans had been announced and invitations sent, the organizers realized that the first edition of Laplace's book had appeared not in 1813 as claimed but in 1812, and the second edition containing the famous "Essai Philosophique sur les Probabilites" in 1814. The editors got around this difficulty by stating in their foreword that this Essai "must have been written in 1813, 150 years before the Berkeley Seminar of 1963".

The collaboration of Neyman and Le Gam continued with the Fifth Berkeley Symposium (Le Cam & Neyman 1967) scheduled for 1965. The first four symposia, which had taken place at five-year intervals since 1945 had been Neyman's sole responsibility. He now asked Le Cam to chair the Organizing Committee and to serve as Coeditor of the Proceedings which by then had grown to five substantial volumes. Five years later (Le Cam, Neyman & Scott 1973), Le Cam also coedited the Proceedings of the sixth (and last) symposium.

A last conference on which the two men collaborated was devoted to an interdisciplinary meeting on cancer models. Since coming to Berkeley, Le Cam had concentrated on theoretical aspects of statistics, but this changed in 1974 as a result of his daughter Linda's being diagnosed with osteosarooma. At that time he began to collaborate[3] with Vera Byers and her

[3]Some comments on this collaboration by Vera Byers are given in Albers et aI. (1990,p.171).

husband Al Levin who successfully treated Linda with the immunotherapy they were developing in their laboratory.

Neyman had became interested in models for the mechanism of carcinogenesis in the 1950's, and in 1958 had spent three months at the National Institutes of Health to learn more about the biological background of the problem and to participate in the work being conducted there. In the Spring of 1981, Le Cam told Neyman of experimental work being done at Berkeley that was relevant to his models. In response, Neyman proposed a conference that would bring together researchers approaching this problem from different points of view, and asked Le Cam to undertake its organization. He stressed the urgency of the problem, and the arrangements were in fact completed in less than a month. The conference took place in July 1981, only a few weeks before Neyman's death of heart failure, and the Proceedings-dedicated to his memory-were published the following year (Le Cam & Neyman 1982).

The week following Neyman's death another member of the Statistics Department, Jack Kiefer, who had experienced no previous symptoms, suffered a fatal heart attack at the young age of only 57. Stunned by these two deaths within a few days of each other, the Department hesitated for some time about a suitable commemoration. Eventually, Le Cam and Elizabeth Scott decided to organize a "Conference in Honor of Jerzy Neyman and Jack Kiefer". The conference took place in June 1983 and the Proceedings (Le Cam & Olshen 1985) were published in two volumes.

18.3 Research

Beginning with his thesis, Le Cam's statistical research has centered on large-sample theory. This has included very general treatments of maximum likelihood and Bayes estimation, introduction of contiguity and local asymptotic normality, superefficiency, and his general theory of the (approximate) comparison of experiments. Additional contributions have been made by many of his close to 40 Ph.D. students, and this body of work-which has been referred to (Feigin 1987) as the Le Cam school of asymptotic methods-was given a comprehensive exposition in Le Cam's 1986 book.

A review of this book (Shiryaev & Koshevnik 1989) states that "the endeavor for generality distinguishes Professor Le Cam himself as well as the book under review". Le Cam strongly disclaims any efforts at generality for its own sake, and justifies it as providing better organization of the material[4]. "It was just more convenient", he writes in the preface to his 'book, "to rewrite the definitions in such a way that the desired theorems are always true, instead of imposing restrictive conditions on a more stan-

[4]Personal communication

dard system". As a result, his work is a powerful resource that takes care of the many special nonregular cases not covered by the simpler classical approaches.

Another reviewer (Dacunha-Castelle 1988) characterizes the book [my translation from the French original] as "the work of a mathematician. It so happens that he is talking about statistics. This is due to fortuitous circumstances, but it is a stroke of good luck for statistics".

Without doubt, Le Cam's work has brought statistics closer to becoming part of mathematics. By the same token, as a consequence of the generality and abstraction of his treatment, it presents considerable difficulty to students and colleagues.[5] His course in large-sample theory was notoriously hard, and students frequently audited it once or even twice before daring to take it for credit. The somewhat forbidding nature of his work has been greatly alleviated locally by his friendliness and patience. He kept his office door open and never seemed to tire of helping his students (and anyone else) with their problems.

Although the construction of his own general theory of experiments occupies the center of Le Cam's work, it by no means exhausts it. There are for example several papers dealing with the Central Limit Theorem; three expository papers with a historical or philosophical slant; a number of applied papers, particularly on immunotherapy and other aspects of cancer research; and papers on occasional special topics.

Le Cam's asymptotic work has been enormously influential. His theory of contiguity is a principal topic of books by Roussas (1972) and Greenwood & Shiryaev (1985), and it plays a major role in Hajek & Sidak (1967). His general approach to large-sample theory and the comparison of experiments forms the central topic of books by Heyer (1982) and Torgersen (1991).

In acknowledgement of his work, Le Cam received in 1957 a prestigious Sloan Fellowship which enabled him to spend a year in Paris in order "to renew contacts with the Bourbaki group of French mathematicians" and in 1971 a Miller Research Professorship at Berkeley. During 1972/73 he served as Director of the Centre de Recherches MatMmatiques of the University of Montreal. The fear that he might accept this as a permanent position was relieved when at the end of the year he decided to return to Berkeley. In 1976 Le Cam was elected to the American Academy of Arts and Sciences. He took early retirement from Berkeley in 1991, but he continues to come to his office daily, with his door remaining open as before.

18.4 REFERENCES

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[5]To alleviate this difficulty Le Cam & Yang (1990) provide a more accessible introduction to essential parts of the theory. In this connection see also Strasser (1985).

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